The opinion in support of the decision being entered today is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte VALERIE SUE ADAMS,
EMMETT DUDLEY CRAWFORD,
MICHAEL EUGENE DONELSON
and DOUGLAS STEPHENS MCWILLIAMS

Appeal 2007-1945
Application 10/669,215
Technology Center 1700

Decided: July 31, 2007

Before CHUNG K. PAK, CHARLES F. WARREN, and LINDA M. GAUDETTE, *Administrative Patent Judges.*

PAK, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1 through 26 and 28 through 42, all of the claims pending in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

STATEMENT OF THE CASE

The subject matter on appeal is directed to "polyester/polycarbonate blends and more particularly, to such blends with reduced yellowness and with increased thermal and melt stability resulting from the catalyst utilized in the production of the polyester." (Specification 1.) These improved properties are said to be "achieved by preparing the blends utilizing polyesters that have produced with a reduced level of titanium catalyst." (Specification 4.) Further details of the appealed subject matter are recited in representative claim 1 reproduced below:

> 1. In a thermoplastic composition comprising a compounded blend of a polyester and a polycarbonate, the improvement comprising preparing the polyester in the presence of a titanium-containing catalyst compound in an amount of from about 1 to about 30 ppm elemental titanium and, optionally, an ester exchange catalyst in an amount of from about 1 to about 150 ppm of an active element utilized when an acid component of the polyester is derived from a diester of a dicarboxylic acid, with ppm based on the total weight of the polyester.

As evidence of unpatentability of the claimed subject matter, the Examiner has relied upon the following references:

Smith, W.A. (Smith), "Chemistry of Miscible Polycarbonate-Copolyester Blends," *Journal of Applied Polymer Science* 26, 4233-4245 (1981).

Allen	US 4,786,692	Nov. 22, 1988
Sublett	US 5,106,944	Apr. 21, 1992
Small	US 5,254,610	Oct. 19, 1993
Hilbert	US 5,886,133	Mar. 23, 1999
Hamilton	US 5,922,816	Jul. 13, 1999

The Examiner has finally rejected the claims on appeal as follows:

1) Claims 1 through 4, 7 through 10, 12, 15 through 20, 31 through 37, 39, 40, and 42 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C.§ 103(a) as unpatentable over the disclosure of Sublett;

2) Claims 1 through 4, 7 through 10, 12, 15 through 20, 31 through 37, 39, 40, and 42 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Sublett and either Hamilton or Smith;

3) Claims 1 through 10, 12 through 20, 31 through 40, and 42 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Sublett, Small and optionally Hamilton or Smith; and

4) Claims 1 through 13, 15 through 26, 28 through 37, and 39 through 42 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Allen and Hilbert.

The Appellants appeal from the Examiner's decision finally rejecting the claims on appeal under 35 U.S.C. §§ 102(b) and 103(a).

ISSUES

1. Does Sublett describe the claimed thermoplastic composition within the meaning of 35 U.S.C. § 102(b)?

2. Would Sublett alone, or in combination with Small, Hamilton and/or Smith, have rendered the claimed thermoplastic composition obvious within the meaning of 35 U.S.C. § 103(a)?

3. Would Allen and Hilbert have rendered the claimed thermoplastic composition obvious within the meaning of 35 U.S.C. § 103?

FACTS, PRINCIPLES OF LAW, AND ANALYSES

1. ANTICIPATION

Under 35 U.S.C. § 102, to establish anticipation, a single prior art reference must describe, either expressly or under the principles of inherency, each and every element of a claimed invention. *See, e.g., In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990). The prior art reference must describe the claimed invention with sufficient specificity to allow one skilled in the art to readily envisage the claimed invention from the prior art reference. *In re Schaumann*, 572 F.2d 312, 315, 197 USPQ 5, 8 (CCPA 1978).

The claimed subject mater is directed to a thermal plastic composition comprising a blend of a polyester and a polycarbonate (e.g., claim 1). The composition is further defined by a process limitation which limits the amount of a titanium-containing catalyst used in producing the polyester to 1 to about 30 ppm elemental titanium (*id*). However, by virtue of using the transitional language "comprising" in claim 1, the claimed thermal plastic composition may contain additional titanium (in the form of a titanium-containing catalyst) and other additives, which are not recited. *In re Baxter*, 656 F.2d 679, 686-87, 210 USPQ 795, 802-03 (CCPA 1981)("As long as one of the monomers in the reaction is propylene, any other monomer may be present, because the term 'comprise' permits the inclusion of other steps, elements, or materials.").

The dispositive question is, therefore, whether the broadly claimed composition embraces Sublett's thermoplastic composition within the meaning of 35 U.S.C. § 102(b). On this record, we answer this question in the affirmative.

As explained in *In re Thorpe*, 777 F.2d 695, 697-98, 227 USPQ 964, 966 (Fed. Cir. 1985):

> Product-by-process claims are not specifically discussed in the patent statute. The practice and governing law have developed in response to the need to enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it is made. For this reason, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself....
>
> The patentability of a product does not depend on its method of production.... If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.... (Citation omitted).

There is no dispute that Sublett teaches a thermoplastic composition containing a blend of a polycarbonate and a polyester, wherein the amount of a catalyst used for making the polyester ranges from 10 ppm to 100 ppm titanium. (Compare Answer 3 with Br. 7). As indicated *supra*, the claimed thermoplastic composition, as broadly recited, does not preclude the presence of additional titanium (in addition to the one used in producing the polyester) such that the total amount of titanium in the composition corresponds to the one taught by Sublett. Hence, we concur with the Examiner's determination that Sublett renders the subject matter defined by

claims 1 through 4, 7 through 10, 12, 15 through 20, 31 through 37, 39, 40, and 42 anticipated within the meaning of 35 U.S.C. § 102(b).

In assessing the propriety of this § 102(b) rejection, we are mindful of the showing of unexpected results relied upon by the Appellants. However, as held in *In re Malagari*, 499 F.2d 1297, 1302-303, 182 USPQ 549, 553 (CCPA 1974), this showing cannot overcome the § 102 rejection.

2. *OBVIOUSNESS*

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary consideration (e.g., unexpected results). *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966). "[A]nalysis [of whether the subject matter of a claim is obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l v. Teleflex, Inc.*, 127 S. Ct. 1727, 1740-41, 82 USPQ2d 1385, 1396 (2007) *quoting In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336-37 (Fed. Cir. 2006); *seeDyStar Textilfarben GmBH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1361, 80 USPQ2d 1641, 1645 (Fed. Cir. 2006)("The motivation need not be found in the references sought to be combined, but may be found in any number of sources, including common knowledge, the prior art as a whole, or the nature of the problem itself."); *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969)("Having established that this knowledge was in the

art, the examiner could then properly rely, as put forth by the solicitor, on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.'").

2(A). PRIMA FACIE CASE

PRIMA FACIE OBVIOUSNESS BASED ON SUBLETT, WITH OR WITHOUT SMALL, SMITH, AND HAMILTON

To the extent that the claims in question are interpreted as excluding the presence of greater than 30 ppm titanium in the claimed thermoplastic composition, we determine that Sublett's recognition of applicability of 10 to 100 ppm titanium (in the form of a titanium-containing catalyst) in forming a polyester used in its blend at least establishes a *prima facie* case of obviousness. As stated in *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003):

> In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a prima facie case of obviousness. *E.g., In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-37 (concluding that a claimed invention was rendered obvious by a prior art reference whose disclosed range ("about 1-5%" carbon monoxide) abutted the claimed range ("more than 5% to about 25%" carbon monoxide)); *In re Malagari*, 499 F.2d at 1303, 182 USPQ at 553 (concluding that a claimed invention was rendered prima facie obvious by a prior art reference whose disclosed range (0.020-0.035% carbon) overlapped the claimed range (0.030-0.070% carbon)); *See also In re Geisler*, 116 F.3d at 1469, 43 USPQ2d at 1365 (acknowledging that a claimed invention was rendered prima facie obvious by a prior art reference whose disclosed range (50-100 Angstroms)

> overlapped the claimed range (100-600 Angstroms)). We have also held that a prima facie case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. v. Banner,* 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985).

This is especially compelling in this instance since Smith or Hamilton, as correctly found by the Examiner at page 4 of the Answer, provides an incentive to employ the lower end of the range described in Sublett. Specifically, Smith and Hamilton teach that residual titanium catalyst from the polyester adversely affects polyester/polycarbonate blends in terms of color and possibly in terms of decreased viscosity. (Smith 4237 and Hamilton, col. 1, ll. 10-62 and col. 2, ll. 53-64). As a consequence of this adverse effect on the polyester/polycarbonate blends, Hamilton, for example, teaches deactivating the residual titanium catalyst therein with a phosphorus-containing compound (col. 1, ll. 45-56 and col. 2, ll. 15-41).

Given the knowledge of the adverse effect of a titanium based catalyst, the applicable amounts of a titanium-containing catalyst in producing a polyester, and the cost involved in employing the catalyst deactivating phosphorus-containing compound, one of ordinary skill in the art would have been led to employ the lower end of the applicable amounts of a titanium-containing catalyst taught by Sublett (10 to 30 ppm titanium), motivated by a reasonable expectation of successfully reducing the amount of the phosphorus-containing compound (catalyst deactivating compound) employed and/or minimizing the adverse effect of the titanium-containing catalyst. *See, e.g., In re Thompson*, 547 F.2d 1290, 1294, 192 USPQ 275,

277 (CCPA 1976) (acknowledging that economic factors alone may provide sufficient motivation to one of ordinary skill in the art to arrive at the claimed subject matter).[1]

PRIMA FACIE OBVIOUSNESS BASED ON ALLEN AND HILBERT

Allen teaches that "it is known to blend polyesters with polycarbonates to provide thermoplastic compositions having improved properties over those based upon either of the single resins alone." (col. 1, ll. 38-42). Allen further teaches:

> More recently, certain amorphous copolyesters, i.e., those having a low degree of crystallinity, have been developed, ...
>
> It has been elsewhere more recently been disclosed that amorphous copolyesters having a low degree of crystallinity may be utilized in polycarbonate blends to provide improvements in impact strength and transparency, processability, solvent resistance, and environmental stress cracking resistance. (col. 2, ll. 39-58.)

Allen defines conventional amorphous polyesters as:

> [T] he reaction product of a C_2-C_{10} alkylene glycol and an aromatic dicarboxylic acid[,] e.g., terephthalic or isophthalic acid. The use of copolyesters of poly(alkylene terephthalate) type is preferred. More particularly, it is preferred to use copolyesters of from 99.5% to 94% by weight of poly(alkylene terephthalate) which contain, incorporated at random in the

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[1] The Appellants have not disputed the Examiner's determination at page 4 of the Answer that one of ordinary skill in the art would have been led to employ the phosphate compounds taught by Small in the thermoplastic composition suggested by Sublett, with or without Smith or Hamilton. *See* Br. and Reply Br. in their entirety.

> chain small amounts of from 0.5 to 5% by weight of dissimilar units in order to break down any tendency whatever for the "100%" pure polyester to crystallize. (Col. 3, ll. 28-38.)

Consistent with the above disclosure, Allen discloses an improved thermoplastic composition comprising a blend of an aromatic polycarbonate and a polyester derived from a glycol and at least one aromatic dicarboxylic acid (col. 4, ll. 19-44). The polyester "may be prepared by procedures well known to those skilled in this art..." using a conventional condensation catalyst, such as a titanium based catalyst (col. 7, l. 52 to col. 8, l. 7). Allen does not specifically mention the amount of the catalyst employed in preparing the polyester.

To remedy this deficiency, the Examiner has relied on the disclosure of Hillbert. Hillbert focuses on using a particular condensation catalyst system to improve the property of a polyester (col. 2, ll. 35-39). The novel catalyst system employed is said to speed up the reaction

> so that it is useful for economical purposes and for making a range of molecular weights useful for molding purposes but which also results in a condensation polymer having good clarity and color. Furthermore, environmental concerns demand that the level of catalyst metals be decreased or minimized which is achieved by using the process or this invention (col. 2, ll. 20-26)

Hillbert goes on to teach a polyester (polyethylene terephthalate or modified polyethylene terephthalate) prepared from a glycol and preferably aromatic dicarboxylic acid or ester (the same components taught by Allen), in the presence of a catalyst system comprising from 1 to about 50 parts of titanium present in the form of an alkyl titanate and from about 1 to about

100 parts of phosphorus in the form of a phosphate ester or phosphoric acid. The resulting polyester is said to be slow to crystallize similar to the amorphous polyester described in Allen. Moreover, the Appellants have not disputed the Examiner's finding at page 5 of the Answer that "parts" means "ppm."

Given the above teachings, we concur with the Examiner that the combined disclosures of Allen and Hillbert would have led to employing the catalyst system of Hilbert in preparing the polyester of the blends taught by Allen, motivated by a reasonable expectation of successfully obtaining the advantages delineated by Hillbert.

2(B). SECONDARY CONSIDERATION (UNEXPECTED RESULTS)

As a rebuttal to the prima facie case of obviousness established by the Examiner, the Appellants appear to contend that the claimed subject matter imparts unexpected results (Br. 7-12). In support of this contention, the Appellants refer to Examples 1 through 4 and Tables 2 through 4 in the Specification (*id*). According to the Appellants, these Examples and Tables show that a thermoplastic composition having the claimed range of titanium unexpectedly provides reduced yellowness and increased melt stability (improved viscosity) and thermal stability (*id*).

The Appellants have the burden of showing unexpected results with respect to the entire scope of the claimed subject matter. *See e.g., In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972). As correctly pointed out by the Examiner at pages 6-8 of the Answer, however, the Appellants have not carried their burden.

First, as correctly found by the Examiner at pages 6-7 of the Answer, one of ordinary skill in the art would have recognized at the time of the invention that yellowness can be reduced by either eliminating or deactivating residual titanium catalyst as evidenced by Smith and Hamilton. Hillbert also teaches employing a small amount of a titanium-containing catalyst to speed up the reaction

> so that it is useful for economical purposes and for making a range of molecular weights useful for molding purposes but which also results in a condensation polymer having good clarity and color. Furthermore, environmental concerns demand that the level of catalyst metals be decreased or minimized which is achieved by using the process or this invention (col. 2, ll. 20-26)

Any other benefits, such as increased melt stability and thermal stability, would have naturally flowed from following the suggestion of the prior art references. *Ex parte Obiaya*, 227 USPQ 58, 60 (BPAI 1985) (holding that the recognition of another advantage flowing naturally from following the suggestion of the prior art cannot be the basis for patentability when the difference would otherwise be obvious). Moreover, the Appellants have not demonstrated that the extent of improvement in melt and thermal stability is significant and of practical advantage.[2] *In re D'Ancicco*, 439 F.2d 1244, 1248, 169 USPQ 303, 306 (CCPA 1973). Thus, in our

[2] To establish the significance of the level of their thermal and melt stability, the Appellants must not only prove that the results involved are significant in this field of technology, but also prove that the alleged difference in the results involved is not within the margin of error attributable to their experiments.

opinion, the evidence of obviousness, on balance, outweighs the evidence of nonobviousness proffered by the Appellants. *In re Nolan*, 553 F.2d 1261, 1267, 193 USPQ 641, 645 (CCPA 1977).

Second, as also correctly found by the Examiner at pages 6-7 of the Answer, the Appellants have not demonstrated that the claimed subject matter imparts unexpected results over the closest prior art, Sublett. *In re Johnson*, 747 F.2d 1456, 1461, 223 USPQ 1260, 1263-64 (Fed. Cir. 1984). We deem Sublet to be the closest prior art since it reduces the formation of undesirable yellow color as desired by the Appellants in their Specification via preparing the polyester of its blend with a specific titanium-containing catalyst system (encompassed by the appealed claims) in an amount corresponding to 10-100 ppm titanium. Sublett exemplifies employing a specific catalytic system in an amount corresponding to 50 ppm titanium (cols. 5-6, Table 1). The Appellants have not shown that the claimed thermoplastic containing, *inter alia*, a polycarbonate and a polyester prepared with 30 ppm or below titanium in the form of Sublett's catalyst system is unexpectedly superior to Sublett's composition containing, *inter alia*, a polycarbonate and a polyester prepared with 50 ppm titanium in the form of Sublett's catalyst system.

Finally, we find that the showing in the Specification is not commensurate in scope with the degree of protection sought by the appealed claims. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 778 (Fed. Cir. 1983); *In re Kollman*, 595 F.2d 48, 55, 201 USPQ 193, 198 (CCPA 1979). While the showing is limited to a blend made of a specific polyester prepared in the presence of an unknown titanium based compound (an

amount corresponding to 12 to 16 ppm elemental titanium) and bisphenol A polycarbonate, the appealed claims are not so limited. The claims, as written, embrace thermoplastic compositions materially different from those shown in Examples 1 through 4 of the Specification. Specifically, the claimed thermoplastic compositions not only include polyesters, polycarbonates and titanium-containing catalysts (including the amount of elemental titanium) materially different from those shown in Examples 1 through 4 of the Specification, but also include catalyst deactivating agents not included in Examples 1 through 4 of the Specification. On this record, the Appellants have not demonstrated that the multifarious thermoplastic compositions encompassed by the appealed claims, including those containing, inter alia, Sublett's titanium-containing catalyst, would behave in the same manner as those shown in Examples 1 through 4 of the Specification.

2(C). CONCLUSION

Thus, based on the totality of record, including due consideration of the Appellants' arguments and evidence, we determine that the preponderance of evidence weighs most heavily in favor of obviousness within the meaning of 35 U.S.C. § 103(a). Accordingly, we determine that the prior art references relied upon by the Examiner would have rendered the claimed subject matter obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103.

ORDER

The decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

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B. J. Boshears
Eastman Chemical Company
P. O. Box 511
Kingsport, TN 37662-5075